PATENT SPECIFICATION

830,859

Date of Application and filing Complete Specification: February 11, 1958. *No.* 4436/58

Application made in Switzerland on February 22, 1957

Complete Specification Published: March 23, 1960

Index at Acceptance:—**Classes 94(1)**, C3(B3:H), C10D3B(1:3:4), C10(J1:J4E:W1:Y).

International Classification:—B65b.

COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Preventing Reinfection of the Sterile Side of a Web of Packaging Material that is Sterile only on one side

We, ALPURA A.G., a Company organised under the Laws of Switzerland, of Bubenbergplatz 8, Berne, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method of, and apparatus for, preventing reinfection of the sterile side of a flexible running web of packaging material that is sterile only on one side. The invention is based on the realisation that it is sufficient to sterilise only the side of the web that is to form the inside of a package to be filled with sterile material, provided it is ensured that the sterilised side of the web does not come into contact with non-sterile surfaces or a germ-containing atmosphere which would lead to reinfection.

According to one aspect of the present invention a method of preventing reinfection of the sterile side of a web of packaging material that is sterile only on one side comprises causing a sterile midium in gas or vapour form to impinge on the sterile side of the web and to sweep over the side edges of the web by spreading outwards over the edges from the point or points at which it impinges on the web.

The sterile side of the web is preferably subjected to impingement along the region of the centre of the web it may, however, be additionally subjected to impingement between the centre of the web and the side edges. The surface of the non-sterile side of the web, at least adjacent the side edges, may advantageously be pressed against a supporting surface by the impingement to which the sterile side of the web is subjected. Moreover, it is advisable to subject regions of the sterile side of the web remote from the centre of the web to impingement by the sterile medium in a direction inclined to the surface of the web.

The invention also embraces an apparatus for carrying out the method described, which apparatus comprises guide means for the running web, and a wall extending approximately parallel to the sterile side of the web but spaced therefrom and having at least one outlet aperture through which a flow of a sterile medium in gas or vapour form can be directed against the sterile side of the web, the point or points of impingement of the sterile medium on the sterile side of the web being spaced inwardly from the side edges of the web.

The web may be guided between two fixed walls with a gap between them extending beyond the side edges of the web in the direction transverse to the running web.

The wall facing the non-sterile side of the web may form a supporting surface for the web.

The invention may be performed in various ways and certain embodiments will now be described by way of example with reference to the accompanying drawings, in which

Figure 1 is a perspective view, partly in section, of apparatus embodying the invention in which the gap through which the web passes is defined by parallel flat walls;

Figure 2 is a fragmentary elevation of one of the walls of the apparatus shown in Figure 1; and

Figures 3 and 4 are respectively a part-sectional elevation and perspective view of a further embodiment in which the web, while being subjected to the impingement of sterile air and simultaneously formed into a tube, is guided into a filling and packing machine.

Referring to Figures 1 and 2, the web 1 which has been sterilised on one side in any suitable manner, for example by means of radiant heat, is moved by transporting means

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(not shown) in the direction of the arrow 12 through a gap 4 formed between two parallel flat walls 2 and 3. The web 1 is guided in such a manner that its sterile side faces the wall 2, which is formed by a plate 6 shaped to enclose a cavity 5. The wall 3 forms a fixed supporting surface for the web 1. The cavity 5 communicates with a pipe 7, through which air drawn in by a blower 8 from the atmosphere and freed of entrained germs in a ceramic filter 9 can be directed into the cavity 5. The wall 2 is provided with a plurality of outlets 10, which are formed by bores 11 in the plate 6. Figure 2 is an elevation of the wall 2 provided with the outlets 10.

When the apparatus described is in operation, the web is continuously moved through the gap 4 in the direction of the arrow 12. At the same time, sterile air is fed through the pipe 7 into the cavity 5, whereby the sterile side of the web is subjected to impingement by sterile air, which emerges from the cavity through the bores 11. The conditions may be such, for example, that the average outlet speed of the air from the bores 11 is about 5 metres per second.

The bores 11 have differing diameters and are disposed in longituninal rows, the distance between two successive bores of the same row varying according to the row. The outlets 10*a* facing the centre of the web are considerably larger and closer to one another than the other outlets. The sterile side of the web is thus subject to impingement with the sterile air mainly along the region of the centre of the web. Outwardly spaced from the row 10*a* in the wall 2 on each side are two further rows of outlets 10*b* and 10*c*. The outlets 10*b* are smaller than the outlets 10*a* and larger than the outlets 10*c*. In addition, the distance between two successive outlets 10*b* and 10*c* is greater than the difference between two successive outlets 10*a*. The bores leading to the outlets 10*c* are inclined in such manner that the regions of the sterile side of the web in the vicinity of the side edges, are subject to impingement by the sterile air in a direction iclined to the surface of the web. The outlets are disposed with respect to the web 1 in such manner that all the points of impingement of the sterile air on the sterile side of the web are inwardly spaced from the side edges.

The action of the apparatus described is as follows. The sterile air flowing through the individual outlets 10 impinges upon the sterile side of the web. The sterile air is distributed from the points of impingement substantially transversely to the longitudinal direction of the web, flowing sideways out of the gap 4 in the direction of the arrows 13 after sweeping the surface of the web. Conditions are so selected that the side edges 1*a* and 1*b* of the web are swept solely by sterile air which spreads towards the edges from points of impingement inwardly spaced from the side edges of the sterile side of the web. In addition, the entire gap 4 is filled with sterile air, while because of the sterile air flowing off in the direction of the arrows 13 no germ-containing external air can penetrate into the gap 4 and come into contact with the sterile side of the web. Under the influence of the impingement described the web—especially near the side edges 1*a* and 1*b*—is pressed on to the wall 3 acting as a supporting surface.

The side of the web resting on the wall 3 and hence also the wall 3 itself are not sterile. However, since the side edges are swept solely by sterile air, which spreads from a point of impingement situated on the sterile side of the web, no germs situated on the wall 3 or on the non-sterile side of the web can pass on to the sterile side of the web: the reason for this is that any germs situated in the region of the side edges on the wall 3 are continuously swept away outwardly or prevented from travelling on to the sterile side of the web. This latter effect is reinforced by the inclined direction of the bores leading into the outlets 10*c*. Reinfection of the sterile side of the web is thus precluded, even though the apparatus as a whole is not disposed in a closed sterile room.

In the embodiment shown in Figures 3 and 4 the web 20, previously sterilised on one side, is moved in the direction of the arrow 24 through a gap 23 formed by the walls 21 and 22. The web 20 consists of paper coated on one side with synthetic plastic, for example polyethylene, the synthetic plastic side constituting the sterile side of the web. The sterile side of the web 20 faces the wall 21, which has a plurality of outlets 25 through which sterile air can be directed on to the sterile side of the web. The sterile air is led through a pipe 26 into a cavity 27, which is formed by a plate 28 part of which constitutes the wall 21. The wall 22 is formed by a plate 19. In the direction of feed 24 of the web the walls 21 and 22 progressively approach the shape of a circular cylinder, whereby the web 20 at its outlet from the gap 23 approaches the form of a tube 20'. At its lower part the wall 21 closes completely to form a cylindrical surface, while the side edges of the wall 2 form a gap 29. The wall 21 extends downward beyond the wall 22 into the tube 20'. The walls 21 and 22 are held at a distance from one another by distance pieces 31. The plate 19 forming the wall 22 is fastened to the housing 51 of a packing and filling machine.

The tube 20' is formed by overlapping the side edges of the web 20. Subjecting the sterile side of the web to impingement by sterile air in a manner similar to that de-

scribed in connection with Figure 1 ensures that no reinfection of the sterile side of the web can take place

Into the interior of the tube formed in the manner described extends a contact pressure roller 30, which is disposed rotatably in holders 18 fastened to the wall 21. A heating shoe 33 fastened on a carrier 32 (Figure 4) presses on the overlapping edges of the web 20 supported by the roller 30 and by heating the synthetic plastic coating sticks the overlapping edges together. The heating shoe 33 is electrically heated. A filling tube 34 for the material to be filled extends into the interior of the formed tube 20'. The tube 20', filled partly to the level 17, is compressed transversely to its longituninal direction by pressing mechanism when the filling and packing machine is in operation. The pressing mechanism comprises pairs of electrically heated pressing jaws 35 and 36, which circulate on endless chains 37 and 38. The chains run over guide wheels 39 and 40, and 41 and 42 respectively, of which the wheels 39 and 41 can be rotated by driving means (not shown). Further pairs of pressing jaws (not shown) work perpendicurlarly to the plane of the drawing, in such manner that the tube 20' guided continuously downwardly is compressed alternately in two directions at right-angles to one another. The downward movement of the pressing jaws situated in the working position at any given time causes the web 20 and the tube 20' to be transported downwardly. The tube 20' is divided off into closed containers 43 by successive compression between pairs of heated pressing jaws.

For the purpose of putting the arrangement described into operation, the web 20 already sterelised on its synthetic plastic side is fed and is formed into the tube 20' in the manner described, the feed of the material to be packed being not yet in operation, and the said tube is compressed between a pair of heated pressing jaws transversely to its longitudinal direction to close the bottom of the tube. Steam, superheated for example to 350°C., is then fed through the tube 26 into the cavity 27, whereby the interior of the cavity and the wall 21 are heated to sterilisation temperature. At the same time, superheated steam is also fed into the shaped tube 20' through the filling tube 34. The steam escapes upwardly and heats the roller 30 with its holders 18 and the outside of the filling tube 34, likewise to sterilisation temperature. The supply of superheated steam is then turned off, sterile air is fed through the pipe 26 into the cavity 27 and blown on to the sterile side of the web, and the filling and packing machine is put into operation. The material to be packed, for example milk, is fed through the filling tube 34 and poured into the continuously formed tube 20'. The previously sterilised coated side of the web does not come into contact with germ-containing atmosphere or non-sterile surfaces during the entire process so that there cannot be any germs inside the closed and filled containers. If the web of paper serving as the packaging material is not capable of withstanding the temperatures required for initial sterilistation, a web of aluminium foil can be stuck to the beginning of the web of packaging material. The described steps for initial sterilisation can then be carried out as long as the tube provisionally consisting of aluminium is situated in the working region of the filling and packing machine.

The invention is of course not limited to the embodiments described. For example, the outlets for the sterile medium could also be in the form of slots. In addition, it would also be possible to use a sterile medium other than sterile air, for example nitrogen.

WHAT WE CLAIM IS:—

1. A method of preventing reinfection of the sterile side of a web of packaging material that is sterile only on one side, which comprises causing a sterile medium in gas or vapour form to impinge on the sterile side of the web and to sweep over the side edges of the web by spreading outwards over the side edges from the point or points at which it impinges on the web.

2. A method as claimed in Claim 1 which comprises subjecting the sterile side of the web to impingement along the region of the centre of the web.

3. A method as claimed in Claim 2 which comprises subjecting the sterile side of the web to impingement additionally between the centre of the web and the side edges.

4. A method as claimed in Claim 1 or Claim 2 or Claim 3 which comprises pressing the surface of the non-sterile side of the web, at least adjacent to the side edges, against a supporting surface by the impingement to which the sterile side of the web is subjected.

5. A method as claimed in any of the preceding claims which comprises subjecting regions of the sterile side of the web remote from the centre of the web to impingement by the sterile medium in a direction inclined to the surface of the web.

6. Apparatus suitable for carrying out the method claimed in any of the preceding claims and comprising guide means for the running web, and a wall extending approximately parallel to the sterile side of the web but spaced therefrom and having at least one outlet aperture through which a flow of a sterile medium in gas or vapour form can be directed against the sterile side of the web, the point or points of impingement of the sterile medium on the sterile side of the web being spaced inwardly from the side edges of the web.

7. Apparatus as claimed in Claim 6, in which the web is guided betwen two fixed walls with a gap between them extending beyond the side edges of the web in the direction transverse to the running web.

8. Apparatus as claimed in Claim 7, in which the wall facing the non-sterile side of the web forms a supporting surface for the web.

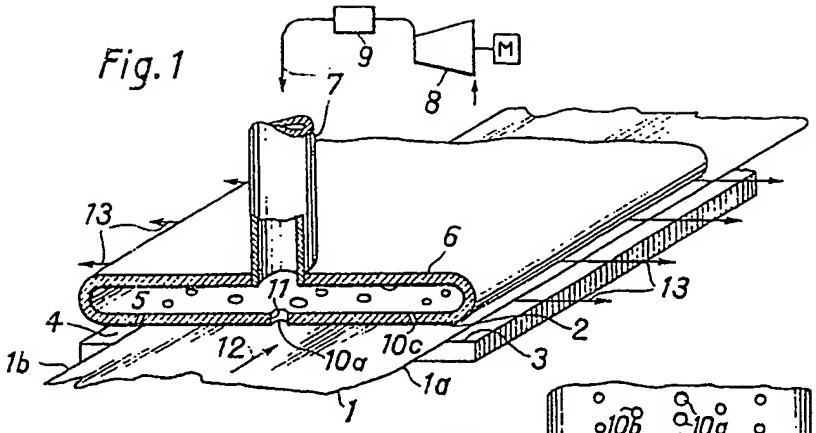
9. A method of preventing reinfection of the sterile side of the web of packaging material that is sterile only on one side, substantially as described with reference to Figures 1 and 2 or Figures 3 and 4 of the accompanying drawings.

10. Apparatus for preventing reinfection of the sterile side of a web of packaging material that is sterile only on one side, substantially as described with reference to Figures 1 and 2 or Figures 3 and 4 of the accompanying drawings.

KILBURN & STRODE,
Agents for the Applicants.

Berwick-upon-Tweed: Printed for Her Majesty's Stationery Office, by The Tweeddale Press Ltd.—1960.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2., from which copies may be obtained

Fig. 1



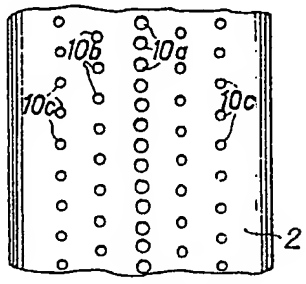
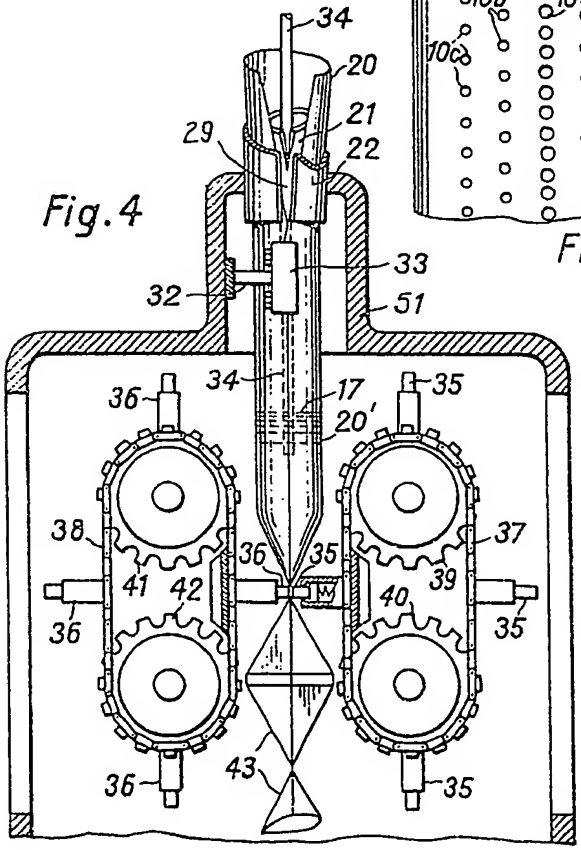


Fig. 2

Fig. 4



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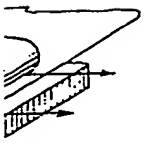
SHEETS 1 & 2



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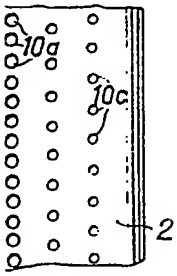

Fig. 2

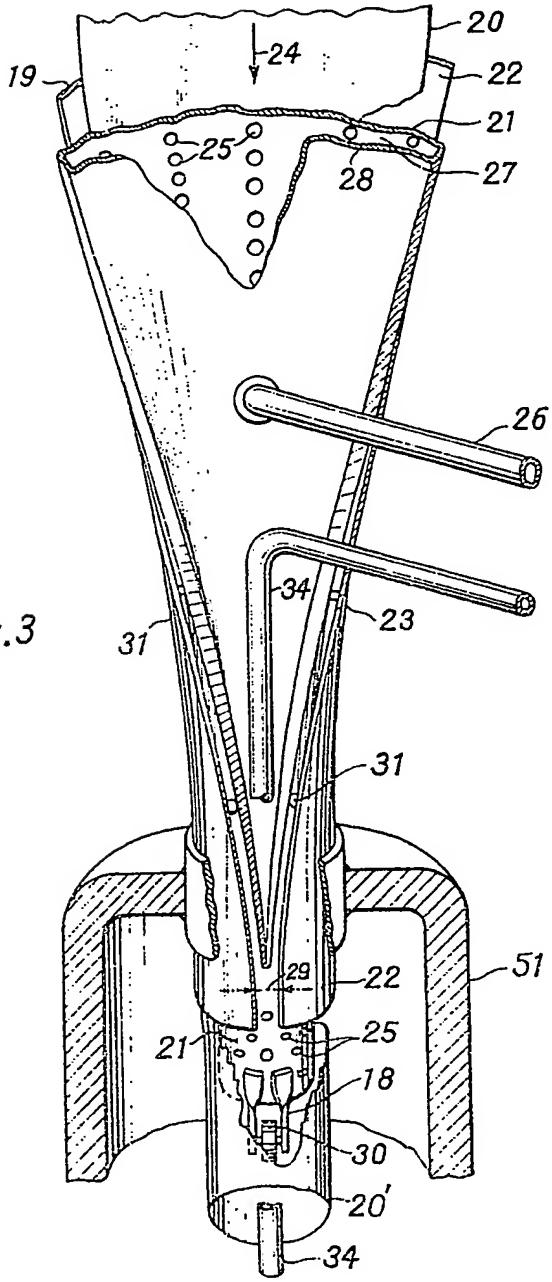

Fig. 3

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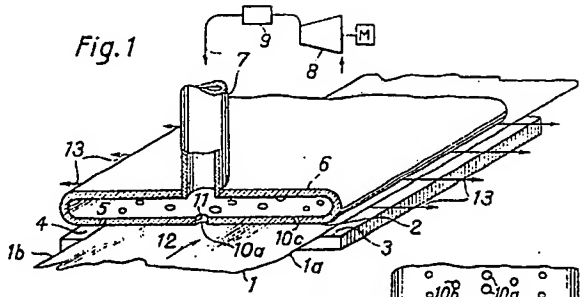
SHEETS 1 & 2

Fig. 1



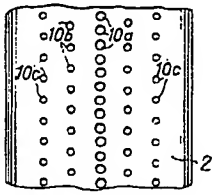


Fig. 2

Fig. 4

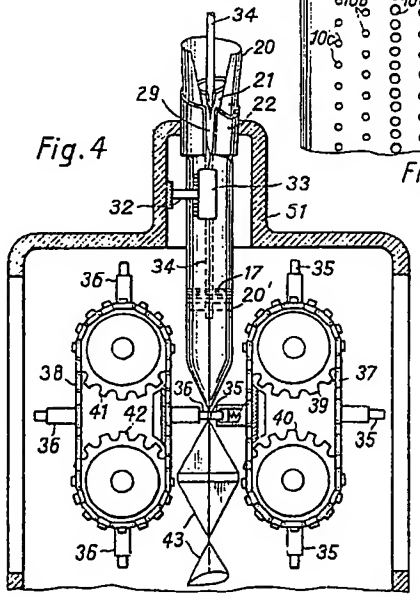


Fig. 3